Table 4-1

Quality Assurance Objectives for Organic Surrogate Analysis
Techalloy Company, Inc.
Union, Illinois

Compound	Water (% Recovered)	Soil (% Recovered)
Volatiles Fraction		
Toluene-d_8	88 - 110	84 - 138
Bromofluorobenzene	86 - 115	59 - 113
1,2-Dichloroethane-d_4	76 - 114	70 - 121
Semi-Volatile Fraction		
Nitrobenzene-d_5	35 - 114	23 - 120
2-Fluorobiphenyl	43 - 116	30 - 115
Terphenyl-d_{14}	33 - 141	18 - 137
Phenol-d_5	10 - 110	24 - 113
2-Fluorophenol	21 - 110	25 - 121
2,4,6-Tribromophenol	10 - 123	19 - 122
2-Chlorophenol-d_4[1]	33 - 110	20 - 130
1,2-Dichlorobenzene-d_4[1]	16 - 110	20 - 130

Note:

U.S. EPA CLP Document No. OLM01.8
[1]Advisory Limits Only

Table 4-2

Summary of Precision, Accuracy, and Completeness Objectives
Techalloy Company, Inc.
Union, Illinois

Parameter	Method	Matrix	Precision (Relative % Difference)	Accuracy (% Recovery)
Metals (Selected App. IX)	ILM02.1	water	20	75 - 125
		soil	20	75 - 125
Cyanide	ILM03.0	water	20	75 - 125
		soil	20	75 - 125
TSS	160.2*	water	20	75 - 125
<u>Volatile Organics by GC/MS</u>	OLM01.8			
1,1-Dichloroethene		water	14	61 - 145
		soil	22	59 - 172
Trichloroethene		water	14	71 - 120
		soil	24	62 - 137
Benzene		water	11	76 - 127
		soil	21	66 - 142
Toluene		water	13	76 - 125
		soil	21	59 - 139
Chlorobenzene		water	13	75 - 130
		soil	21	60 - 133
<u>Semi-Volatile Organics by GC/MS</u>	OLM01.8			
<u>Base/Neutral</u>				
1,2,4-Trichlorobenzene		water	28	39 - 98
		soil	23	38 - 107
Acenaphthene		water	31	46 - 118
		soil	19	31 - 137
2,4-Dinitrotoluene		water	38	24 - 96

Table 4-2

Summary of Precision, Accuracy, and Completeness Objectives
Techalloy Company, Inc.
Union, Illinois

(Continued)

Parameter	Method	Matrix	Precision (Relative % Difference)	Accuracy (% Recovery)
<u>Base Neutrals (continued)</u>				
		soil	47	28 - 89
Pyrene		water	31	26 - 127
		soil	36	35 - 142
N-nitroso-di-N-propylamine		water	38	41 - 116
		soil	38	41 - 126
1,4-Dichlorobenzene		water	28	36 - 97
		soil	27	28 - 104
<u>Acid</u>				
Pentachlorophenol		water	50	9 - 103
		soil	47	17 - 109
Phenol		water	42	12 - 110
		soil	35	26 - 90
2-Chlorophenol		water	40	27 - 123
		soil	50	25 - 102
4-Chloro-3-methylphenol		water	42	23 - 97
		soil	33	26 - 103
4-Nitrophenol		water	50	10 - 80
		soil	50	11 - 114

References:
U.S.EPA CLP Document Nos. OLM01.8 and ILM02.1.

* Methods for Chemical Analysis of Water and Wastes (MCAWW), EPA-600/4-79-020, March 1993.

$$\text{Completeness (\%)} = \frac{\text{(number of valid data) x 100}}{\text{(number of samples collected for each parameter analyzed)}}$$

If the percent completeness for the project is calculated to be below the QC acceptance criteria of 95 percent, WESTON's Project Director, Project Manager, and the U.S. EPA RCRA Project Coordinator will be notified. They will evaluate the overall impact on the project and the ability of the analytical objectives to meet project objectives, and will determine what, if any, corrective actions are required.

Representativeness

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative parameter that is dependent upon the proper design of the sampling program and proper laboratory protocol.

The sampling network is designed to provide data representative of the conditions at the Techalloy facility. During development of this network, WESTON considered past waste disposal practices, existing analytical data, the physical setting, and environmental conditions inherent to the facility. The rationale of the sampling network is discussed in detail in the FSP (Appendix A).

Representativeness will be satisfied by ensuring that the field sampling procedures outlined in the FSP are followed, proper sampling techniques are used, proper analytical procedures are followed, and holding times of the samples are not exceeded in the laboratory. Representativeness will also be assessed by the analysis of the field duplicate samples.

Comparability

Comparability expresses the confidence with which one data set can be compared with another. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The new analytical data may not be comparable to data from the earlier real estate assessment work or recent RCRA closure work. The previous data may not be directly comparable to the new data because of the difference in procedures and QA objectives.

SECTION 5

SAMPLING PROCEDURES

Sampling procedures are specified in the FSP (Appendix A).

SECTION 6

SAMPLE CUSTODY

It is the U.S. EPA Region V's policy to follow sample custody and chain of custody protocols as described in the U.S. EPA, *NEIC Policies and Procedures*, EPA-330/9-78-DDI-R, Revised June 1985. This custody is in three parts: sample collection, laboratory analysis, and final evidence files. Final evidence files, including all original laboratory reports and purge files, are maintained under document control in a secure area.

A sample or evidence file is in a person's custody if any of the following conditions is satisfied:

- It is in his possession.
- It is in his view, after being in his possession.
- It was in his possession, and he placed it in a secure location.
- It is in a designated secure area.

6.1 FIELD CHAIN-OF-CUSTODY PROCEDURES

This section summarizes the key requirements for maintaining the chain of custody in the field. Section 5 and 6 of the FSP (Appendix A) detail the specifics of handling samples and completing sample documentation forms.

6.1.1 Field Procedures

The field sampler is personally responsible for the care and custody of the samples until the samples are transferred to the Field Sample Manager, and/or properly dispatched. As few people as possible should handle the samples.

All bottles will be labeled with a project sample number. The Field Sample Manager and/or the field sampler will complete the samples labels using waterproof ink, unless adverse weather prevents use of ink. If the sampler cannot use waterproof ink, the sampler will note the alternative procedure and state why it was used. For example, in cold weather, a logbook notation would explain that the sampler used a pencil to fill out the sample label because the indelible ink marker would not function in freezing weather.

The U.S. EPA's RCRA Project Coordinator and WESTON's Project Manager will review all field activities at the completion of all work. It will be determined whether the field crew followed proper custody procedures. If variances are noted, they will decide whether additional samples are required.

6.1.2 Field Logbooks and Documentation

Field logbooks will provide the means of recording the data collecting activities performed. As such, entries will be described in as much detail as possible so that persons going to the Techalloy facility could reconstruct a particular situation without relying on human memory.

Field logbooks will be bound field survey books, or notebooks. One logbook will be assigned to the FTL and one logbook to each sampling team. The books will be stored in the document control center when not in use. Each logbook will be identified by a project-specific document number.

The title page of each logbook will contain the following:

- Person to whom the logbook is assigned.
- Logbook number.
- Project name.

- Project start date.
- End date.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, level of personal protection being used, and the signature of the person making the entry will be entered. The names of visitors to the site, field sampling or investigation team personnel, and the purpose of their visit will also be recorded in the field logbook.

Measurements made and samples collected will be recorded. All entries will be made in ink (weather permitting) and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark and initialed by the person making the correction. Whenever a sample is collected, or a measurement is made, a detailed description of the location of the station shall be recorded. The number of the photographs taken of the station, if any, will also be noted.

Samples will be collected in accordance with the sampling procedures outlined in Section 3 of the FSP (Appendix A). The equipment used to collect samples will be noted, along with the time of sampling, sample description sample location, depth at which the sample was collected, volume, and number of containers. A sample identification number will be assigned prior to sample collection. Field duplicate samples, which will receive a separate sample identification number, will be noted under sample description.

6.1.3 Transfer of Custody and Shipment Procedures

All samples will be recorded on a WESTON-Gulf Coast Laboratories, Inc. chain-of-custody form (Figure 6-1). An SOP for completing the chain-of-custody form is presented in Appendix C. When transferring the possession of samples, the individuals relinquishing and

WESTON Analytics Use Only

Custody Transfer Record/Lab Work Request

WESTON

Page ____ of ____

Client ____
Est. Final Proj. Sampling Date ____
Work Order # ____
Project Contact/Phone # ____
AD Project Manager ____
QC ____ Del ____ TAT ____
Date Rec'd ____ Date Due ____
Account # ____

Refrigerator #
#/Type Container: Liquid / Solid
Volume: Liquid / Solid
Preservatives

ANALYSES REQUESTED →

ORGANIC: VOA, BNA, Pest/PCB, Herb
INORG: Metal, CN

WESTON Analytics Use Only

MATRIX CODES:
S - Soil
SE - Sediment
SO - Solid
SL - Sludge
W - Water
O - Oil
A - Air
DS - Drum Solids
DL - Drum Liquids
L - EP/TCLP Leachate
WI - Wipe
X - Other
F - Fish

Lab ID	Client ID/Description	Matrix QC Chosen (✓) MS	MSD	Matrix	Date Collected	Time Collected

FIELD PERSONNEL: COMPLETE ONLY SHADED AREAS

Special Instructions:

DATE/REVISIONS:
____ 1. ____
____ 2. ____
____ 3. ____
____ 4. ____
____ 5. ____
____ 6. ____

WESTON Analytics Use Only

Samples were:
1) Shipped ___ or Hand Delivered ___
Airbill # ____
2) Ambient or Chilled
3) Received in Good Condition Y or N
4) Labels Indicate Properly Preserved Y or N
5) Received Within Holding Times Y or N

COC Tape was:
1) Present on Outer Package Y or N
2) Unbroken on Outer Package Y or N
3) Present on Sample Y or N
4) Unbroken on Sample Y or N
COC Record Present Upon Sample Rec't Y or N

Relinquished by	Received by	Date	Time	Relinquished by	Received by	Date	Time

Discrepancies Between Samples Labels and COC Record? Y or N
NOTES:

RFW 21-21-001/A-7/91 ____ L372 ____ L373 ____ L375 ____ L377 ____ L378 Ref# ____ Cooler# ____ 381 596a

FIGURE 6-1

WESTON MANAGERS DESIGNERS/CONSULTANTS

Three Hawthorn Parkway
Vernon Hills, Illinois
60061

CHAIN OF CUSTODY FORM
GULF COAST LABORATORIES

TECHALLOY COMPANY, INC.
Union, Illinois

receiving will sign, date, and note the time on the chain-of-custody form. This record documents transfer of custody of samples from the sampler to another person (such as the Field Sample Manager).

All sample shipment containers will be accompanied by the Chain-of-Custody Record identifying the contents. A copy of the chain-of-custody will be retained by the Field Sample Manager and the remaining five copies will accompany the shipment to the laboratory.

If the samples are sent by common carrier, a bill of lading should be used. Receipts of bills of lading will be retained as part of the permanent documentation. If sent by mail, the package will be registered with return receipt requested. Commercial carriers are not required to sign off on the custody form as long as the custody forms are sealed inside the sample cooler and the custody seals remain intact. All shipment coolers will have two pre-numbered chain-of-custody seals placed on the outside of each cooler following closure of the cooler. Figures 6-2 and 6-3 show typical examples of WESTON-Gulf Coast Laboratories, Inc. chain-of-custody seals and sample container labels.

6.1.4 Summary of Field Chain-of-Custody Procedures

The WESTON field team will consist mainly of the following:

- The Field Team Leader.
- The Site Health and Safety Coordinator.
- The Field Sample Manager/Custodian.

There will be a minimum of two people in each field team. All members will be considered to be field samplers and may be involved in the actual sample collection. Depending on the

WESTON/GULF COAST LABORATORIES

OFFICIAL SEAL

No 29664

CAD93\100\15492 A

FIGURE 6-2

MANAGERS DESIGNERS/CONSULTANTS

Three Hawthorn Parkway
Vernon Hills, Illinois
60061

EXAMPLE OF A WESTON GULF COAST LABORATORIES CHAIN-OF-CUSTODY SEAL

TECHALLOY COMPANY, INC.
Union, Illinois

WESTON/GULF COAST LABORATORIES 2417 Bond Street University Park, IL 60466 (708) 534-5200 WESTON/GULF COAST LABORATORIES

Sample Date: ____/____/____

Sample Time: ______ : ______ AM PM

Date Submitted: ____/____/____

Description ____________________

____

____________________ Sampled by: __________

WATER: ___ Other

___ Surface ___ Ground ___ Waste ___ Drinking

___ WASTE ___ SOIL ___ OTHER

___ Y ___ N : Is Sample Filtered?

___ Y ___ N : Are Sample Preservatives Added?

___ Y ___ N : Are Known Hazardous Substances Present?

SAMPLE MANAGEMENT

___ Municiple Discard ___ IEPA

___ Incinerate ___ USEPA

___ Special Handling Required

___ Return to Customer

___ Additional Analyst Information

RFW# ______________

Bottle ________ of ________

ANALYSIS

___ General Inorganics	___ TOC	___ TOX
___ BNA	___ FOG	___ Phenols
___ Pesticides	___ PCB	___ Cyanide
___ Nutrients	___ Metals	___ Sulfide

___ Other ____________________

LIMITED SAMPLE GRID

FIGURE 6-3

WESTON MANAGERS DESIGNERS/CONSULTANTS

Three Hawthorn Parkway
Vernon Hills, Illinois
60061

WESTON GULF COAST LABORATORIES
EXAMPLE OF SAMPLE CONTAINER LABEL

TECHALLOY COMPANY, INC.
Union, Illinois

magnitude of the field operations, the WESTON Project Manager will evaluate the need for additional personnel. When necessary, the Field Team Leader will also perform in the capacity of the Site Health and Safety Coordinator. To the extent practicable, the Field Sample Manager will not be given any additional responsibilities other than sometimes performing as a field sampler. If more than two people are in the field team, there may be personnel who are designated as only field samplers.

The Field Team Leader will have overall responsibility for ensuring the completion of all field activities in accordance with procedures described in this document. The Field Team Leader is the overall coordinator of sampling activities at the site and is the communication link between field team members and the WESTON Project Manager. The Field Team Leader will assign specific field duties to the team members based on input from the WESTON Project Manager.

The Field Sample Manager will be responsible for preparing (and reviewing for accuracy and completeness) all sample paperwork such as chain-of-custody forms, sample labels, and any other paperwork that is required for sample documentation. The Field Sample Manager will also prepare all sample shipment documentation such as airbills. If the Field Sample Manager requests assistance from other members of the field team in completing sample paperwork, the Field Sample Manager will be responsible for reviewing and ensuring the accuracy and completeness of this paperwork before he/she encloses it in the sample shipment container. All members of the field team may be involved in the actual sample packaging and shipment. The Field Sample Manager is responsible for tracking all sample paperwork from the time of receipt until the completed paperwork copies are given to the WESTON Project Manager.

The Field Team Leader is responsible for maintaining the field logbook. The field logbook will contain notes made by the Field Team Leader on site activities, including the tracking of the samples from the time of sample collection to the delivery of the samples to the shipping carrier. The names and function of all field team members will be listed in the logbook. During the course of sample collection activities, the Field Team Leader will document in the logbook the times and dates of all sampling activities (i.e., who collected the sample(s), when the sample(s) was collected, who delivered the sample(s) to the Field Sample Manager, when the sample coolers were delivered to the shipping carrier, etc.) If the Field Sample Manager was part of the sampling team, it will be specifically noted.

The Field Team Leader will note the names of the actual samplers for each station location, as well as the time, date, station location identifier and sample identifiers, etc.

The collected samples will be transported to the Field Sample Manager by a member or members of the field team. If the sample locations are far apart, multiple samples may be collected prior to delivering them to the Field Sample Manager. The Field Team Leader will ensure that any preservation requirements (e.g., keeping the samples cool) are implemented prior to the time that the samples are delivered to the Field Sample Manager.

Upon receipt of the samples, the Field Sample Manager will be responsible for ensuring that custody is transferred. The Field Sample Manager will require the field team member delivering the samples to sign and date the chain-of-custody form associated with the samples as the relinquisher of the samples in the "relinquished by" area on the form. The Field Sample Manager will then sign the forms as the recipient. The signed forms will be the same forms that will accompany the samples to the laboratory. Prior to enclosing the forms in the shipment container, the Field Sample Manager will sign the various chain-of-custody forms to indicate he or she is relinquishing custody to the shipment carrier. If the forms are sealed in the shipment container with chain-of-custody seals on the outside of the container, the shipment carrier will not sign the forms as the recipient. The Field Sample

Manager will be responsible for completing the remainder of all forms except as noted previously.

The team member delivering the samples will also provide the Field Sample Manager with the individual time of collection for each sample. All sample documentation shipped with the sample to the laboratory will become part of the evidence file for the samples. The field logbook will be maintained in the site file or in the custody of the Field Team Leader.

The Field Sample Manager assumes custody of the samples once he or she has signed the chain-of-custody form(s). If the Field Sample Manager must leave the "staging area" (where sample preparation for shipment and documentation completion is performed), the samples will either be locked inside of the sampling team's vehicle/trailer, or will be secured in a cooler with custody seals. The custody seals will be inspected by the Field Sample Manager upon return to the staging area to ensure they are intact. These practices will be followed whenever necessary to maintain custody of the samples in the field and will be logged into the field logbook.

6.2 LABORATORY CHAIN-OF-CUSTODY PROCEDURES

The laboratory chain-of-custody procedures presented herein pertains to WESTON-Gulf Coast Laboratories, Inc. The purpose of laboratory chain-of-custody procedures is to document the history of sample containers and samples, including sample extracts or digestates. The associated records should provide traceability from the time of preparation of sample containers, through collection, shipment, analysis, and disposal of the sample. Items under custody will be:

- Maintained in the physical possession or view of the responsible party.

- Placed and/or stored in a designated secure area. This secure area must be accessible only to authorized personnel.

A primary step in the evidentiary trail is to provide proof that the sample collected in the field is the sample that was actually analyzed. The field chain-of-custody forms, when properly completed, provide the necessary information.

In addition to providing accountability for the physical location of the sample, sample integrity is dependent on proper collection and storage of the sample. Description of chain-of-custody procedures associated with sample collection, receipt, storage, preparation, analysis, and general security procedures are described in subsequent sections of this chapter.

The area supervisors are responsible for the records received or generated by their respective areas at the laboratory. Laboratory documentation used to establish chain-of-custody and sample identification may include the following:

- Field chain-of-custody forms or other paperwork that arrives with the sample.
- Custody Transfer Record/Laboratory Work Request, also referred to as the field/laboratory chain-of-custody form.
- Sample labels or tags attached to each sample container that may contain the following information: sample date, time (2400 clock), sample description , sample matrix, sample temperature upon receipt, filtration, preservation, and known hazards information, sample management (disposal), project sample number, and parameter group. These labels/tags are verified for accuracy against the paperwork received with the samples. The signed chain-of-custody form will serve as documentation of this verification, rather than attempting to peel or remove tags/labels to place in the written documentation file.
- Custody seals attached to shipment containers. Custody seals will prevent the container from being opened without authorization. The intact condition of the custody seals will serve as documentation that the shipment container was

not tampered with after having left the custody of the Field Sample Manager. This will be noted on the chain-of-custody form by the laboratory sample custodian upon receipt at the laboratory.

- Sample preparation logs (i.e., extraction and digestion information recorded in hard-bound laboratory books that are filled out in legible handwriting, and signed and dated in ink by the chemist).

- Sample analysis logs (e.g., metals, GC/MS, etc. information recorded in hard-bound laboratory books that are filled out in legible handwriting, and signed and dated in ink by the chemist).

- Sample storage log (same as the laboratory chain of custody).

6.2.1 <u>Sample Receipt</u>

A designated laboratory sample custodian is responsible for samples received at WESTON-Gulf Coast Laboratories, Inc. In addition to receiving samples, the sample custodian is also responsible for documentation of sample receipt, storage before and after sample analysis, and documentation of eventual proper disposal of samples. Upon receipt, the sample custodian will:

- Inspect the sample container for integrity. The presence of leaking or broken containers will be noted on the chain-of-custody form (Figure 6-1). The sample custodian will sign (with date and time of receipt) the chain-of-custody form, thus assuming custody of the samples. If chain-of-custody forms are not included, the sample custodian will initiate these forms.The sample custodian will inform the laboratory Project Director and/or Laboratory Manager of the missing documentation. Corrective action procedures will determine future action associated with the samples.

- Check the temperature of the sample and confirm that sample preservation was executed.

- Coordinate sample bottle information (e.g., sample tag/label, etc.), logbook information, chain-of-custody records, and all pertinent information associated with the sample to verify sample identity and to ensure that all information is correct. Any inconsistencies will be resolved with the field sampling representative and corrective action specified before sample analysis proceeds.

- Assign a unique WESTON batch number to each sample received. The WESTON batch number will be recorded on the chain of custody and on the bottle labels using a permanent marker. The WESTON batch number is a tracking number that is the primary means of tracking a sample through the laboratory. Samples are logged into a hard-bound sample logbook by documenting appropriate information.

- Move the samples to one of the locked sample storage refrigerators (maintained at 4° ±2° C) for storage prior to analysis. The storage location will be recorded on the chain-of-custody form.

- Maintain the original of the chain-of-custody form in the sample log-in area. Copies of the chain of custody are provided to the laboratory Report Manager, to each laboratory Section Manager, to the respective Unit Leaders, to the Project Manager, and to the QA Section.

- Alert appropriate production unit of any analyses requiring immediate attention due to short holding times.

- Log the sample information into the Laboratory Information Management System (LIMS). These data include laboratory number, field sample number, dates collected and received, project or client identification, and parameters to be analyzed.

6.2.2 Laboratory Sample Storage

Samples will be maintained in storage in one of the locked storage refrigerators prior to sample preparation and analysis. The SOPs for sample storage are summarized below.

Storage refrigerators are maintained at 4° ±2° C. The temperature is monitored by the laboratory security system and is additionally recorded daily in a bound logbook by the QA Section. During working hours, if equipment failure (e.g., compressor failure, door left open, etc.) results in the temperature of the storage refrigerator exceeding the upper or lower control limits, an audible alarm will sound and the samples will be moved to suitably controlled storage until the problem has been corrected. During off working hours, the alarm is automatically transferred to the security agency who alerts (via beeper call) laboratory and maintenance personnel so that prompt corrective action can be taken.

Refrigerator storage is designed to segregate samples to prevent cross-contamination and to prevent sample mix-up. This includes storage of volatiles samples separate from semivolatiles and inorganics samples. Within the refrigerators, samples are stored by WESTON batch number for easy retrieval.

Access to laboratory facilities is restricted to laboratory personnel or escorted guests. Therefore, once custody transfer to the laboratory has been completed, the sample is considered placed and stored in a designated secure area accessible only to authorized personnel (i.e., the laboratory facility). The samples are stored in a locked walk-in refrigerator, and the key is securely kept by the sample custodian. When Techalloy facility samples are relinquished to an analyst, both the analyst and the sample custodian are required to sign and date the appropriate lines on the laboratory chain-of-custody form (also described as the Custody Transfer Record/Laboratory Work Request Form). When the samples are returned to the appropriate cooler, both parties must again sign the original chain-of-custody form. All samples at the WESTON-Gulf Coast Laboratories, Inc. will be maintained at this level of custody.

6.2.3 Laboratory Sample Tracking

The SOPs for laboratory tracking are summarized in this section.

Samples for semivolatile analysis are received by the Organic Sample Preparation Section for extraction prior to analysis by gas chromatography, GC/MS, or liquid chromatography.

SAMPLE EXTRACTION RECORD

Sheet no.: 1

Extract. Date: 03/20/91 Extraction Batch No: 91LE0560 Analyst: JS Method: CONT

Test: 0625 Cleanup Date: Analyst: Client: AAA COMPANY, INC

LIMS Report Date: 04/01/91 Solvent: DCM Adsorbent:

Sample No:	Client Name / Client ID	pH	Initial WT/VOL	Surr. Mult.	Spike Mult.	Final VOL BASE	Final VOL ACID	Split Mult.	GPC Y/N	% Solids	C/D FACTOR
9103L344-	AAA COMPANY, INC										
005 T	ES-1	7	100	1.0		1	1	1.0	N		10.0
005 TR	ES-1	7	100	1.0		1	1	1.0	N		10.0
005 TS	ES-1	7	100	1.0	1.0	1	1	1.0	N		10.0
006 T	ES-2	7	100	1.0		1	1	1.0	N		10.0
007 T	ES-3	7	100	1.0		1	1	1.0	N		10.0
008 T	ES-4	7	100	1.0		1	1	1.0	N		10.0
9103L353-	CANTWAIT ENVIRONMENTAL										
004 T	8013	7	100	1.0		1	1	1.0	N		10.0
004 TR	8013	7	100	1.0		1	1	1.0	N		10.0
004 TS	8013	7	100	1.0	1.0	1	1	1.0	N		10.0
91LE0560-MB1 T		7	1000	1.0		1	1	1.0	N		1.0
91LE0560-MB1 TS		7	1000	1.0	1.0	1	1	1.0	N		1.0
91LT0038-LB1 T		7	100	1.0		1	1	1.0	N		10.0

Comments:
Surrogate: 500 UL ESU 27K @ 100/200 UG/ML
Spike: 500 UL TCLP SPIKE @ 100/200 UG/ML

Extracts Transferred	Relinquished By	Date Time	Received By	Date Time	Reason for Transfer

FIGURE 6-4

WESTON MANAGERS DESIGNERS/CONSULTANTS

Three Hawthorn Parkway
Vernon Hills, Illinois
60061

WESTON GULF COAST LABORATORIES
SAMPLE EXTRACTION RECORD FORM

TECHALLOY COMPANY, INC.
Union, Illinois

All pertinent data are recorded in a bound laboratory notebook, and assigned a preparation batch number. This extraction information is transferred to the LIMS and a hard-copy Sample Extraction Record is generated. A copy of this form is shown in Figure 6-4. The original is placed on the facing page of the laboratory notebook where extraction data have been entered and is used for custody transfer documentation to the analyst. Copies are provided to the analyst to inform them that extracts are ready for analysis.

6.2.4 Sample Disposition

All samples will be held a minimum of 60 days after the data report is submitted to the client. Samples may be held longer due to special requests or specific contract requirements. All hazardous samples will be disposed of commercially or returned to the client.

When samples are transferred from the laboratory to any other destination, chain-of-custody protocols are followed.

6.2.5 Laboratory Recordkeeping

Data related to sample manipulation/preparation/analysis procedures and observations will be documented by the analyst/technician in the sample extraction log, sample digestion log, sample distillation log, analysis log, or the technician's personal logbook. These are hard-bound notebooks that are issued by the Laboratory Quality Assurance Section. Laboratory notebook pages are signed an dated daily by laboratory analysts. Corrections to notebook entries are made by drawing a single line through the erroneous entry and writing the correct entry next to the one crossed out. A reason for the correction will be noted, as appropriate. All corrections are initiated and dated by the analyst.

6.2.6 Laboratory Building Security

WESTON-Gulf Coast Laboratories, Inc. maintains controlled building access at all times. All non-WESTON laboratory personnel are required to sign in at the receptionist's desk and are escorted by laboratory personnel while in the building.

The laboratory is locked at all times and monitored by an ADT Security System, unless a receptionist is present to monitor building access (i.e., between the hours of 8:00 a.m. and 5:00 p.m., Monday through Friday at designated facilities). This security system not only monitors building access, but also monitors the temperature in the sample storage refrigerators. If the control temperature range is exceeded during working hours, an audible alarm sounds. During nonworking hours, a silent alarm alerts ADT. Response by laboratory personnel is described below.

The locked building is accessed by laboratory employees by using a card key. Additionally, a passcode for the Building Security System may be required if no other employees are in the building.

Any breach of security during nonworking hours releases a silent alarm to the security agency who alerts the local law enforcement agency and one of three laboratory personnel via beeper call. Police response to security alarms takes place within 5 minutes and laboratory personnel are on site within 20 minutes.

6.3 FINAL EVIDENCE FILES CUSTODY PROCEDURES

WESTON's Vernon Hills office is the custodian of the evidence file and will maintain the contents of the evidence files for all Techalloy facility activities. The content of the evidence file will include all relevant records, reports, correspondence, logs, field logbooks, laboratory sample preparation and analyses logbooks, data packages, drawings, pictures, chain-of-custody records/forms, and data review reports.

The WESTON office evidence files will be under the custody of the WESTON Project Manager in the WESTON Vernon Hills, Illinois office in a secured, limited access area. The files will be kept for a set period of time mandated by EPA and will be offered to EPA prior to disposal.

WESTON-Gulf Coast Laboratories, Inc. will also maintain an evidence file for analytical and related data that are generated. The file will be managed in the following manner:

- All raw data such as hard-bound laboratory notebooks and logbooks, strip charts and instrument printouts, Lotus spreadsheets, and magnetic tapes are to be retained for a minimum of five years. All raw data and final reports are documented and stored in a manner which is easily retrievable.

- All hard-bound laboratory notebooks and logbooks are assigned a book number by the QA Section. A new book will be assigned for each instrument or parameter as the most current book is completed.

- Instrument printouts and strip charts for the GC, HPLC, GC/MS, etc. groups are stored in file cabinets in each specific laboratory area. Older documents are stored by date of analysis in WESTON's secure archives area.

- Final sample reports are filed alphabetically by client for future reference. After one year, these records are transferred to WESTON's secure archives area, and kept on file for a minimum period of five years, unless otherwise specified.

SECTION 7

CALIBRATION PROCEDURES AND FREQUENCY

This section describes procedures for maintaining the accuracy of all instruments and measuring equipment used for conducting field tests and laboratory analyses. The field team will calibrate the instruments and equipment prior to each use or on a scheduled periodic basis.

7.1 FIELD INSTRUMENTS AND EQUIPMENT

Instrument and equipment used to gather, generate, or measure environmental data will be calibrated with sufficient frequency and in such a manner that the accuracy and reproducibility of results are consistent with the manufacturer's specifications. WESTON further requires that field instruments be calibrated and maintained by trained personnel.

Equipment to be used during the field sampling will be examined to certify that it is in operating condition. This includes checking the manufacturer's operating manual and the instructions for each instrument to ensure that all maintenance requirements are being observed. Field notes from previous sampling trips will be reviewed so that any prior equipment problem is not overlooked and all necessary repairs to equipment have been made.

Calibration of field instruments is governed by the specific SOP for the applicable field analysis method, and such procedures take precedence over the following general discussion. Calibration of field instruments will be performed at the intervals specified by the manufacturer or more frequently as conditions dictate. In the event that an internally calibrated field instrument fails to meet calibration/checkout procedures, it will be returned to the manufacturer for service.

The field team will calibrate the field pH meter and the conductivity meter prior to each day's use. The SOPs in Appendix B outline the calibration and maintenance programs for each instrument. Appendix B also presents the operating procedures for field measurements.

All calibration performed in the field will be documented in a field logbook. WESTON's FTL will maintain a master calibration and maintenance file at the facility office for each measuring instrument. The file will include at least the following information:

- Name of device or instrument calibrated.
- The serial or I.D. number of the device or instrument.
- Frequency of calibration.
- Date of calibration.
- Results of calibration.
- Name of person performing the calibration.
- Identification of the calibration media (e.g. HNu gas, pH buffer solution).

The field team will visually examine tape measures prior to each day's use.

7.2 LABORATORY INSTRUMENTS

This section discusses calibration procedures for WESTON-Gulf Coast Laboratories, Inc. as they pertain to the analytical methods contained in the SOPs in Appendix D.

The analyst must calibrate all instruments prior to use as measurement devices. To do so, the analyst must establish the instrumental response to known reference materials. The manner in which various instruments are calibrated depends on the particular type of instrument and its intended use. After calibration is complete, all sample measurements are made within the calibrated range of the instrument. The analyst documents the preparation of all reference materials used for calibration a standards preparation notebook.

Instrument calibration typically consists of two types: initial calibration and continuing calibration. Initial calibration procedures establish the calibration range of the instrument and determine instrument response over that range. Typically, the analyst uses five analyte concentrations establish instrument response over a concentration range. The instrument response over the range is generally absorbance, peak height, etc., which can be expressed as a linear model with a correlation coefficient (e.g., for UV-Visible-Infrared Spectrophotometry) or as a response factor or amount vs. response plot (e.g., for Gas Chromatography, Gas Chromatography/Mass Spectrometry, High Performance Liquid Chromatography).

Continuing calibration usually includes measurement of the instrument response to fewer calibration standards and requires that the instrument response compare within certain limits (e.g., plus or minus 10 percent) of the initial measured instrument response. Continuing calibration may be used within an analytical sequence to verify the stability of calibration throughout the sequence, or to demonstrate that instrument response did not drift during an idle period.

Table 7-1 summarizes specific instrument calibration procedures for various instruments. Appendix B presents the methods in detail.

7.2.1 <u>Inorganic Methods</u>

<u>Initial Calibration</u>

Analysts will calibrate the laboratory instruments prior to each day's use. The analysts prepare calibration standards from stock solutions, and they prepare working calibration

Table 7-1

Calibration Procedures Summary for Analytical Instruments
Techalloy Company, Inc.
Union, Illinois

Criteria			
Parameter Measured	Reference	Activity	Requirements
Volatiles by GC/MS	OLM01.8	Instrument Performance Check	25 ng BFB injected every 12 hours. Must meet ion abundance criteria for BFB as shown in OLM01.8.
		Initial Calibration	Calibration standard containing all target analytes at conc. levels of 10, 20, 50, 100, 200 ug/L. All analytes must meet their established minimum RF and maximum %RSD of 20.5%. Analytes without a maximum %RSD must have a minimum RF = 0.01. Up to two analytes may be out of limits but %RSD must be <40% and RF>0.01.
		Continuing Calibration	Mid-point standard with all target analytes. All analytes must meet their established minimum RF and minimum %D of 25.0%. Compounds without a maximum %D must have a minimum RF of 0.01. Up to 2 compounds may be out of limits but their %D must be less than 40% and RF > 0.01.

Table 7-1

Summary of Calibration Procedures for Analytical Instruments
Techalloy Company, Inc.
Union, Illinois
(Continued)

Criteria			
Parameter Measured	Reference	Activity	Requirements
Semi-Volatiles by GC/MS	OLM01.8	Instrument Performance Check	50 ng DFTPP injected every 12 hours. Must meet ion abundance criteria as shown in OLM01.8.
		Initial Calibration	Standard containing all analytes at conc. of 20, 50, 80, 120, 160 ug/L. All analytes must meet their established minimum RF and maximum %RSD of 20.5%. Compounds without a minimum %RSD must have a RF >0.01. Up to 4 compounds may be out of limits but their %RSD must be less than 40% and RF greater than 0.01. The following compounds are not required for OLM0.18 but may be used at the 20 ng level: 2, 3, and 4-Nitroaniline, 2,4,5-Trichlorophenol, 4,6-Dinitro-2-methylphenol, Pentachlorophenol, 4-Nitrophenol and 2,4-Dinitrophenol.
		Continuing Calibration	The 50 ng/uL standard with all target analytes is used as the continuing calibration standard. Analyzed every 12 hours. All analytes must meet their established minimum %D of 25.0%. Compounds without a maximum %D must have a RF >0.01. Up to 4 compounds may be out of limits but their %D must be less than 40% and RF greater than 0.01.

Table 7-1

Summary of Calibration Procedures for Analytical Instruments
Techalloy Company, Inc.
Union, Illinois
(Continued)

Criteria			
Parameter Measured	Reference	Activity	Requirements
Metals by ICP	ILM02.1	Initial Calibration	The instrument is profiled with a Hg lamp according to Thermo Jarrell Ash specifications. Two points, a blank and a standard, are used to calibrate the instrument. Each point consists of three burns and the results are reported in intensity units.
		Initial Calibration Verification	After the initial calibration, an ICV prepared from an alternate source than the calibration standard is analyzed. The ICV is at the midpoint of the calibration curve and must be within 10% of the known value to be acceptable. Linearity is verified by the analysis of standards at 50% and 20% of the calibration standard concentration. The correlation coefficient must be $\geq$ 0.995 to be acceptable. These standards are run once daily.
		Continuing Calibration Verification	A CCV is run at a frequency of 10% to confirm that the calibration has not drifted. Results must be within 10% of the known value to be acceptable.

Table 7-1

Summary of Calibration Procedures for Analytical Instruments
Techalloy Company, Inc.
Union, Illinois
(Continued)

Criteria			
Parameter Measured	Reference	Activity	Requirements
Metals by GFAA	ILM02.1	Initial Calibration	Six points, a blank and five standards, are run for the element in question. The low standard is run at the CRDL level and the curve cc factor must be 0.995 or greater. Each point consists of two burns which must fall within a range of 20% RSD. For specific element standard levels, refer to the SOP.
		Initial Calibration Verification	After the initial calibration, an ICV is run to verify the linearity of the curve. The ICV is run at the midpoint of the calibration curve and must fall within a 10% acceptance range. If the CCV is out of range, the run is terminated and recalibration is required.
		Continuing Calibration Verification	A CCV is run at a frequency of 10% (20 burns) to ensure the accuracy of the run. The CCV is run at the midpoint of the calibration curve and must fall within a 10% acceptance range. If the CCV is out of range, the run is terminated and recalibration is required.
Total Suspended Solids	EPA 160.2	Analytical Balance Performance Check	Balances are checked daily prior to use with class S weights of 0.1 gram and 10 gram. +/- 0.0005 g weight range is applied.
		Oven Temperature Check	Oven temperature is checked before samples are placed in the oven and when they are removed from the oven. 103-105°C temperature range is applied.

standards fresh daily. The working standards will include a blank and a minimum of five concentrations to cover the anticipated range of measurement.

At least one of the calibration standards will be at the desired reporting detection limit. The analyst will calculate a linear regression over the range of calibration. The regression's correlation coefficient must be at least 0.995 in order to consider the responses linear over a range. If a correlation coefficient of 0.995 cannot be achieved, the instrument must be recalibrated before use. Calibration data, including the correlation coefficient, is entered into laboratory notebooks to maintain a permanent record of instrument calibrations.

An initial calibration verification (ICV) standard is analyzed immediately after standardization, followed by an initial calibration blank (ICB). The ICV must be from a source other than that used for initial calibration. The ICV must fall within plus or minus ten percent of the true value, or the analyst must repeat the initial calibration. The ICB must be free of target analytes at and above the reporting limit, or the analyst must repeat the initial calibration.

Continuing Calibration

The analyst verifies the initial calibration during the analysis sequence by analyzing a continuing calibration blank (CCB) and a continuing calibration verification standard (CCV) after every ten samples. The response of the continuing calibration verification standard must be within plus or minus ten percent recovery of the true value. The continuing calibration blank must be free of target analytes at and above the reported detection limit.

If any initial or continuing calibration verifications or blanks exceed their acceptance criteria, then the analyst must terminate analysis and recalibrate the instrument. The analyst must reanalyze all samples analyzed since the last valid verification of calibration.

7.2.2 Gas Chromatography/Mass Spectrometry (GC/MS)

The analyst calibrates all GC/MS instrumentation to set specifications prior to analysis of samples. The specifications vary depending on the requirements of the analytical program and the designated analytical method.

Tuning and GC/MS Mass Calibration

At the beginning of the daily work shift, the analyst must tune the GC/MS system with decafluoro-triphenylphosphine (DFTPP) for semivolatiles analysis.

For purposes of tuning, WESTON-Gulf Coast Laboratories, Inc. defines the work shift as a 12-hour period, beginning with the injection of DFTPP. The tuning expires after 12 hours of analysis. Ion abundances will be within the periods that the specific program requirements dictate.

Initial Calibration

After the analyst tunes an instrument, he/she generates initial calibration curves for analytes appropriate to the analyses to be performed. To do so, at least five solutions containing known concentrations of authentic standards of compounds of concern are used. These solutions are generally "cocktails" of the method's target analytes. The calibration curves will bracket the anticipated working range of analyses. For some compounds in the calibration standard cocktail, the detection is difficult at the lowest calibration appropriate for the majority of the compounds in the mix. In these instances, a four-point initial calibration will be acceptable. The analyst verifies linearity by evaluating the response factors (RF) for the initial calibration standards: Calibration Check Compounds (CCCs) must have a % RSD of less than 30 percent.

Once an acceptable calibration is obtained, samples may be analyzed up until the expiration of the tuning. At that time, the instrument must be re-tuned prior to further analysis. After an acceptable tuning, a continuing calibration standard may be analyzed in place of a full five-point calibration if the percent RSD criteria of 30 percent are met. Otherwise, the analyst must re-establish a five-point curve.

The laboratory will maintain calibration data, including linearity verification, in the laboratory's permanent records of instrument calibrations.

Continuing Calibration

During each operating shift, the analyst may test a single calibration standard to verify that the instrument responses remain within the initial calibration determinations. The response factor for each target compound in the daily standard is calculated and recorded, then compared to the average RF from the initial calibration.

If significant (greater than 25 percent deviation) RF drift is observed for the CCCs, the analyst will take appropriate corrective actions to restore confidence in the instrumental measurements. In addition, a minimum RF of 0.050 for semivolatiles must be reported for system performance check compounds (SPCCs). If criteria cannot be met, an acceptable five-point initial calibration must be re-established.

7.2.3 Gas Chromatography (GC)

The analyst will calibrate gas chromatographs before each day's use. Calibration standard mixtures will be prepared from appropriate reference materials and will contain analytes appropriate for the method of analysis.

Initial Calibration

The laboratory will prepare working calibration standards for initial calibration weekly. The working standards will include a calibration blank and at least five calibration standards covering the anticipated range of measurement. The low level standard must be near a concentration which is equivalent to the quantitation limits for the method. The other standards must extend through the linear working range of the detector. The parameters requiring quantitation must have a correlation coefficient of greater than 0.995 or have an average calibration factor of less than 20 % RSD in order for results to be calculated from a linear regression curve, otherwise, a non-linear curve can be used. Any extracts containing parameters of interest which exceed the concentration of the high level standard, must be diluted to bring the parameters within the range of the standards.

Continuing Calibration

The analyst will verify the response of the instrument for each analysis sequence by evaluating a mid-range calibration check standard. In order to demonstrate that the initial calibration curve is still valid, the calibration check standard must be within plus or minus fifteen percent recovery of the initial calibration for the compounds of interest or the instrument must be recalibrated. For multiple-analyte methods, this check standard may contain a representative number of target analytes rather than the full list of target compounds. Optionally, initial calibration (i.e., a calibration using the full range of concentration levels) can be performed at the beginning of the analytical sequence.

Within the analysis sequence, instrument drift will be monitored by analysis of a mid-range calibration standard every ten samples. The percent difference (% D) in calibration factors (CFs) for the continuing calibration standard compared to the average CF from the initial calibration will be calculated and recorded. If significant (greater than 15 % D) calibration factor drift is observed for the compounds of interest, appropriate corrective actions will be taken to restore confidence in the instrumental measurements.

SECTION 8

ANALYTICAL PROCEDURES

The present QAPP assumes that WESTON-Gulf Coast Laboratories, Inc. will perform all chemical analysis of soil and groundwater samples from the RFI. If WESTON should assign an alternative laboratory to perform some or all of the chemical analyses, an addendum to the QAPP will address the analytical requirements and specifications of the chosen laboratory.

This QAPP calls for analyzing by the procedures that the U.S. EPA CLP would provide. The CLP procedures will be used to analyze for organic and inorganic parameters selected from the U.S. EPA Appendix IX list of parameters. The selected Appendix IX parameters will encompass all organic and inorganic parameters associated with past Techalloy operations and the results of previous investigative activities. All other classes of parameters (e.g., SVOCs) to be analyzed for are provided as a purely confirmatory measure.

The analytical procedures associated with private well sampling activities are presented in the Techalloy Private Well Sampling Plan (PWSP) dated May 1993 attached for convenience in Appendix F of this QAPP.

8.1 LABORATORY ANALYTICAL PROCEDURES

Soil and Groundwater Samples

WESTON-Gulf Coast Laboratories, Inc. will analyze all soil and groundwater samples collected during the Techalloy RFI. Tables 8-1, 8-2, and 8-3 present the list of parameters for which all or some of the RFI samples will be analyzed. In order to achieve the necessary data quality for the Techalloy sample analyses, the WESTON-Gulf Coast Laboratories, Inc. will use the analytical methodology of the U.S. EPA CLP for volatile organic, semivolatile organic and selected Appendix IX metals analyses. The laboratory SOPs comply with the following analytical protocols:

Table 8-1

Selected Appendix IX Volatile Organic Compounds
Contract Required Quantitation Limits
Techalloy Company, Inc.
Union, Illinois

Compound	CRQLs[1]	
	Water (µg/L)	Soil[2] (µg/kg)
Acetone	10	10
Benzene	10	10
Bromodichloromethane	10	10
Bromoform	10	10
Bromomethane	10	10
2-Butanone	10	10
Carbon disulfide	10	10
Carbon tetrachloride	10	10
Chlorobenzene	10	10
Chlorodibromomethane	10	10
Chloroethane	10	10
Chloroform	10	10
Chloromethane	10	10
1,1-Dichloroethane	10	10
1,2-Dichloroethane	10	10
1,1-Dichloroethene	10	10
1,2-Dichloroethene	10	10
1,2-Dichloropropane	10	10
cis-1,3-Dichloropropene	10	10
trans-1,3-Dichloropropene	10	10
Ethylbenzene	10	10
2-Hexanone	10	10

Table 8-1

Selected Appendix IX Volatile Organic Compounds Contract Required Quantitation Limits Techalloy Company, Inc. Union, Illinois (Continued)

Compound	CRQLs[1]	
	Water ($\mu g/L$)	Soil[2] ($\mu g/kg$)
Methylene Chloride	10	10
4-Methyl-2-pentanone	10	10
Styrene	10	10
1,1,2,2-Tetrachloroethane	10	10
Tetrachloroethene	10	10
Toluene	10	10
1,1,1-Trichloroethane	10	10
1,1,2-Trichloroethane	10	10
Trichloroethene	10	10
Vinyl chloride	10	10
Xylene	10	10

Reference:

U.S. EPA CLP Document No. OLM01.8.

Note:

[1] CRQLs taken directly from USEPA CLP Document No. OLM01.8.
[2] Soil PQLs are based on a wet weight basis. Dry weight results will be higher depending on the percent total solids in each individual sample.

Table 8-2

Analytical Reporting Limits
Selected Appendix IX Inorganics
Techalloy Company, Inc.
Union, Illinois

Parameter[6]	CRDLs[1]		IDLs[2,3]	
	Water (μg/L)	Soil[4] (mg/kg)	Water (μg/L)	Soil[4] (mg/kg)
Metals (App. IX)				
Antimony	60	12	24.2	4.84
Arsenic	10	2	1.6	0.32
Barium	200	40	1.6	0.32
Beryllium	5	1	0.8	0.16
Cadmium	5	1	4.3	0.86
Calcium	5,000	1,000	22.2	4.44
Chromium	10	2	5.6	1.12
Cobalt	50	10	4.3	0.86
Copper	25	5	2.8	0.56
Lead	3	0.6	1.76	0.35
Mercury	0.2	0.1	0.2	0.1
Nickel	40	8	12.3	2.46
Potassium	5,000	1,000	653	130.6
Selenium	5	1	1.6	0.32
Silver	10	2	2.9	0.58
Sodium	5,000	1,000	27.1	5.42
Thallium	10	2	1.7	0.34
Tin[5]	100	10	18.4	3.68
Vanadium	50	10	3.4	0.68
Zinc	20	4	3.4	0.68
Cyanide	10	0.5	N/A	N/A
Ammonia	200	6	180	5.4
Chloride	2,000	100	710	35.5
Nitrate	100	1	100	1

Table 8-2

Analytical Reporting Limits
Selected Appendix IX Inorganics
Techalloy Company, Inc.
Union, Illinois
(Continued)

Parameter[6]	CRDLs[1]		IDLs[2,3]	
	Water (μg/L)	Soil[4] (mg/kg)	Water (μg/L)	Soil[4] (mg/kg)
Sulfate	5,000	50	5,000	50
Total Suspended Solids[5]	5 mg/L	N/A	N/A	N/A

Note:
[1] Contract Required Detection Limit (CRDL) reporting limits are taken from USEPA CLP Document Number ILM02.1.
[2] Metals results are reported to the CRDL, however, results are reported down to the IDL if the values are between the CRDL and the IDLs. Such values are flagged with a "B".
[3] IDLs are performed quarterly and are subject to change.
[4] Soil Reporting Limits are based on a wet weight basis. Dry weight results will be higher depending on the percent total solids in each individual sample.
[5] Tin, ammonia, chloride, nitrate, sulfate, and TSS are not CLP parameters and are reported using internal reporting limit.
[6] The metals identified in this Table are a subset of the Appendix IX list and represent the metals of concern at the Techalloy facility.

Table 8-3

Selected Appendix IX Semivolatile Organic Compounds Contract Required Quantitation Limits (CRQLs) Techalloy Company, Inc. Union, Illinois

Compound	CRQLs[1]	
	Water (μg/L)	Soil[2] (μg/kg)
Acenaphthene	10	330
Acenaphthylene	10	330
Anthracene	10	330
Benzo(a)anthracene	10	330
Benzo(b)fluoranthene	10	330
Benzo(k)fluoranthene	10	330
Benzo(a)pyrene	10	330
Benzo(g,h,i)perylene	10	330
Benzyl butyl phthalate	10	330
Bis(2-chloroethyl)ether	10	330
Bis(2-chloroethoxy)methane	10	330
Bis(2-ethylhexyl)phthalate	10	330
Bis(2-chloroisopropyl)ether	10	330
4-Bromophenyl phenyl ether	10	330
Carbazole	10	330
4-Chloroaniline	10	330
2-Chloronaphthalene	10	330
4-Chloro-3-methylphenol	10	330
2-Chlorophenol	10	330
4-Chlorophenyl phenyl ether	10	330
Chrysene	10	330

Table 8-3

Selected Appendix IX Semivolatile Organic Compounds Contract Required Quantitation Limits (CRQLs) Techalloy Company, Inc. Union, Illinois (Continued)

Compound	CRQLs[1]	
	Water (μg/L)	Soil[2] (μg/kg)
Dibenzo(a,h)anthracene	10	330
Dibenzofuran	10	330
Di-n-butylphthalate	10	330
1,2-Dichlorobenzene	10	330
1,3-Dichlorobenzene	10	330
1,4-Dichlorobenzene	10	330
3,3'-Dichlorobenzidine	10	330
2,4-Dichlorophenol	10	330
Diethyl phthalate	10	330
2,4-Dimethylphenol	10	330
Dimethyl phthalate	10	330
4,6-Dinitro-2-methylphenol	25	800
2,4-Dinitrophenol	25	800
2,4-Dinitrotoluene	10	330
2,6-Dinitrotoluene	10	330
Di-n-octylphthalate	10	330
Fluoranthene	10	330
Fluorene	10	330
Hexachlorobenzene	10	330
Hexachlorobutadiene	10	330
Hexachlorocyclopentadiene	10	330
Hexachloroethane	10	330
Indeno(1,2,3-cd)pyrene	10	330

Table 8-3

Selected Appendix IX Semivolatile Organic Compounds Contract Required Quantitation Limits (CRQLs) Techalloy Company, Inc. Union, Illinois (Continued)

Compound	CRQLs[1]	
	Water ($\mu g/L$)	Soil[2] ($\mu g/kg$)
Isophorone	10	330
2-Methylnaphthalene	10	330
2-Methylphenol (o-Cresol)	10	330
4-Methylphenol (m-Cresol)	10	330
Naphthalene	10	330
2-Nitroaniline	25	800
3-Nitroaniline	25	800
4-Nitroaniline	25	800
Nitrobenzene	10	330
2-Nitrophenol	10	330
4-Nitrophenol	25	800
N-Nitrosodiphenylamine	10	330
N-Nitroso-di-n-propylamine	10	330
Pentachlorophenol	25	800
Phenanthrene	10	330
Phenol	10	330
Pyrene	10	330
1,2,4-Trichlorobenzene	10	330
2,4,5-Trichlorophenol	25	800
2,4,6-Trichlorophenol	10	330

References:
U.S. EPA CLP Document No. OLM01.8.

Notes:
[1] CRQLs taken directly from U.S. EPA CLP Document No. OLM01.8.
[2] Soil PQLs are based on a wet weight basis. Dry weight results will be higher depending on the percent total solids in each individual sample.

- Selected Appendix IX Volatile Organics - U.S. EPA CLP Document No. OLM01.8 using Gas Chromatography/Mass Spectrometry (GC/MS).

- Selected Appendix IX Semivolatile Organics - U.S. EPA CLP Document No. OLM01.8 using GC/MS.

- Selected Appendix IX Inorganics - U.S. EPA CLP Document No. ILM02.1 using Inductively Coupled Argon Plasma (ICAP) and Graphite Furnace Atomic Absorption Spectrometry (GFAA). Cyanide - U.S. EPA CLP Document No. ILM02.1. Tin - EPA 600/4-79-020 Method 6010.

- Total Suspended Solids - EPA 600/4-79-020 Method 160.2 and Standard Methods, 17th Edition, Method 2540D.

Appendix D presents the SOP for Tin and TSS.

8.2 PROTOCOLS FOR SCREENING TESTS IN THE FIELD

The procedures for field measurements of pH, conductivity and temperature are described in the SOPs in Appendix B.

SECTION 9

INTERNAL QUALITY CONTROL CHECKS

9.1 FIELD SAMPLE COLLECTION

WESTON will assess Quality Control (QC) for field sampling through the collection of field duplicate and field blank samples. Section 5 of this QAPP describes the applicable procedures and frequencies.

9.2 QUALITY CONTROL OF FIELD MEASUREMENTS

QC procedures for field measurements are limited to checking the reproducibility of the measurement by obtaining multiple readings and/or by calibrating the instruments. QC of field sampling will involve collecting field duplicates in accordance with the applicable procedures described in the FSP (Appendix A) and the level of effort indicated in Table 2-13.

9.3 LABORATORY INTERNAL QUALITY CONTROL CHECKS

The Laboratory Quality Assurance Program Plan will control the daily quality of analytical data generated at WESTON-Gulf Coast Laboratories, Inc. This section of the QAPP describes the types of internal quality control checks used in the analytical chemistry laboratory. If a given method's QC protocol is more stringent than the laboratory guidelines, the analyst will follow the method's protocol.

In order to assess the validity of a reported result, QC indicators are placed in the measurement system. The indicators provide a tool for evaluating how well a method works. QC indicators are available to evaluate method performance at both the preparation and the measurement steps, to evaluate matrix effects. Table 9-1 lists the inorganic indicators. Table 9-2 lists the organic indicators.

9.3.1 Method Performance QC Indicators

- Preparation Batch - Most samples to be analyzed in the laboratory require some pretreatment before a measurement can be made. The necessary pretreatment may include extraction, digestion, distillation, etc. During the pretreatment step, samples are arranged into discrete, manageable groups, called preparation (prep) batches, to aid and control uniform treatment for all samples. Each prep batch will have a maximum of 20 investigative samples of the sample matrix (e.g., soil or water). In addition, the analyst adds QC indicators such as blanks, spikes, and duplicates to each prep batch to monitor the performance of the system. The laboratory will carry all QC associated with a preparation batch through the entire analytical procedure, from preparation to final analysis.

- Preparation Blanks - The laboratory uses the preparation blank (PB), also known as a method blank (MB) or reagent blank, to monitor potential contamination from the sample preparation process. The analyst will prepare preparation (prep) blank by processing a volume of deionized laboratory water for water samples, or a purified solid matrix for soil/sediment samples (when available), through the entire analytical scheme. The reagent blank volume must be approximately equal to the sample volumes being processed. Results will be calculated based on starting with a "blank" soil approximately equal to the weight of the samples.

  For metals, the prep blank will be prepared by processing a volume of deionized laboratory water for both water (PBW) and soil or sediment (PBS) samples through the entire analysis scheme. Final results will be calculated as µg/L for the PBW. To facilitate comparison to the actual field samples, final results for the PBS will be calculated as mg/kg or µg/kg, assuming 100 percent solids and a weight equivalent to the aliquot used for the corresponding investigative samples.

- Laboratory Control Samples and Blank Spikes - Laboratory control samples and blank spikes are equivalent by definition. Laboratory control sample (LCS) is the terminology that the inorganics group uses, while blank spike (BS) is the terminology that the organics group uses. The LCS or BS solution

Table 9-1

Inorganic Instrument Performance Indicators

<table>
<tr><th rowspan="2">Performance Indicator
and Analysis Frequency</th><th colspan="4">Criteria</th></tr>
<tr><th>AA</th><th>ICP</th><th>CVAA</th><th>Other</th></tr>
<tr><td>Initial Calibration Verification (ICV)[1]:
analyze immediately after
initial calibration</td><td>90-110 %R</td><td>90-110 %R</td><td>80-120 %R</td><td>90-110 %R</td></tr>
<tr><td>Initial Calibration Blank (ICB):
analyze immediately after ICV</td><td>|CRDL|</td><td>|CRDL|</td><td>|CRDL|</td><td>|CRDL|</td></tr>
<tr><td>Interference Check Samples
(ICSA and ICSAB):
analyze after ICV, before samples</td><td>NA</td><td>80-120 %R
(ICSAB)</td><td>NA</td><td>NA</td></tr>
<tr><td>CRDL[5] Standard (CRA and CRI):

CRA: analyze after ICV/ICB, but
before samples

CRI: analyze after ICV/ICB, but
before samples and at the end
of the run or minimum of two
times per 8 hour shift</td><td>CRA[3]</td><td>CRI[4]</td><td>CRA[3]</td><td>NA</td></tr>
<tr><td>Continuing Calibration Verification (CCV):
analyze at 10% interval
or AA: every 2 hours
or ICP: every 8 hours</td><td>90-110 %R</td><td>90-110 %R</td><td>80-120 %R</td><td>90-110 %R</td></tr>
<tr><td>Continuing Calibration Blank (CCB):
analyze immediately after CCV</td><td>|CRDL|</td><td>|CRDL|</td><td>|CRDL|</td><td>|CRDL|</td></tr>
<tr><td>Linear Range Standard (LRS):
quarterly</td><td>NA</td><td>95-105 %R</td><td>NA</td><td>NA</td></tr>
<tr><td>Interelement Corrections For ICP:
annually or as needed after service</td><td>NA</td><td>minimally
Al, Ca,
Fe, Mg</td><td>NA</td><td>NA</td></tr>
</table>

Table 9-1

Inorganic Method Performance Indicators (Continued)

Performance Indicator and Analysis Frequency	Criteria			
	AA	ICP	CVAA	Other
Preparation Blank (PB) one per digestion batch of $\leq$20 samples per matrix	$\lvert$CRDL$\rvert$	$\lvert$CRDL$\rvert$	$\lvert$CRDL$\rvert$	$\lvert$CRDL$\rvert$
Laboratory Control Sample (LCSW): one per digestion batch of $\leq$20 samples per water matrix	80-120 %R except Ag, Sb	80-120 %R except Ag, Sb	80-120 %R	80-120 %R
LCSS (solid): same as water	for actual soil LCSS, limits established case by case basis: refer to the "certified" results accompanying the soil			
Matrix Spike (S): one per digestion batch of $\leq$20 samples per matrix	75-125 %R	75-125 %R	75-125 %R	75-125 %R
Duplicate Sample (D) one per digestion batch of $\leq$20 samples per matrix	$\leq$20 %RPD	$\leq$20 %RPD	$\leq$20 %RPD	$\leq$20 %RPD
ICP Serial Dilution (L): one per RFW batch of $\leq$20 samples per matrix (performed at instrument)	NA	90-110 %R	NA	NA
Analytical Spike at Instrument (A): all furnace analyses, @2X CRDL (except Pb spiked at 20 μg/L for CLP, 10-20 μg/L other protocols), immediately following the sample	85-115 %R except MSA and Matrix Spike	NA	NA	NA
Method of Standard Additions (MSA): when sample absorbance or conc. is not <50% of analytical bench spike absorbance or conc., and single analytical bench spike at the instrument is <85% or >115%, then requires full MSA, i.e., 3 concentration levels plus a blank (see also ILM02.0)	correlation coefficient (R) >0.995 if R <0.995, reanalyze once, report result with best R	NA	NA	NA

NOTES:
1. The ICV must be prepared from different stock sources than those used for the initial calibration standards.
2. One of the initial calibration standards for cyanide must be at the CRDL.
3. The CRA must be at the CRDL or the IDL, whichever is greater.
4. The CRI must be at 2X the CRDL or 2X the IDL, whichever is greater. Required for every wavelength used for analysis, except those for Al, Ba, Ca, Fe, Mg, Na, K, and elements not on the TCL.
5. CRDL is the Contract Required Detection Limit.

Table 9-2

Organic Performance Indicators

	Criteria	
Performance Indicator	Volatiles by GC/MS	Semi-Volatiles by GC/MS
Instrument Tune and Calibration	Refer to OLM01.8	Refer to OLM01.8
Method (Laboratory) Blank	<CRQL (<5x CRQL for common lab contaminants) Daily plus 1/12 hours	<CRQL Daily plus 1/20 samples per extraction batch per matrix
Instrument Blank	N/A	N/A
Laboratory Duplicate	See Matrix Spike/ Duplicate	See Matrix Spike/ Duplicate
Surrogate	N/A	Every Sample Refer to OLM01.8 for % Recovery
Matrix Spike	Daily per run per matrix Refer to OLM01.8 for % Recovery	Daily per extraction plus 1/20 per matrix Refer to OLM01.8 for % Recovery
Matrix Spike Duplicate	Daily per run per matrix Refer to OLM01.8 for % Recovery and % RPD	Daily per extraction plus 1/20 per matrix Refer to OLM01.8 for % Recovery and % RPD
Internal Standard Area	Each sample 50 - 200% of amount in calibration standard	Each sample 50 - 200% of amount in calibration standard
Check Standard	SPCC and CCC per OLM01.8 requirements	SPCC and CCC per OLM01.8 requirements

must be from a different source than the standards used for calibration. The laboratory analyzes a calibration verification standard the LCS/BS solution may be the same as one of these solutions.

The laboratory control sample is a water sample of known concentration (e.g., a sample of laboratory reagent grade water spiked with the analytes of interest), independent of the sample matrix. The laboratory control sample is processed through the entire preparation and analysis procedure concurrently with the investigative samples to demonstrate acceptable method performance, independent of the investigative sample matrix. If a solid LCS (LCSS) is not available, the water LCS will be processed through the soil preparation (e.g., organic extractions). The facilitate comparison to the actual field samples, final results for the LCSS will be calculated as mg/kg or μg/kg, assuming 100 percent solids and a weight equivalent to the aliquot used for the corresponding investigative samples.

For organics, in particular for multi-analyte methods, the LCS (or BS) may be surrogate compounds in the blank or a select number of target analytes in fortified method blanks.

One solid LCS and blank spike is performed for each preparation batch of 20 or fewer samples. Duplicate analysis allows precision and accuracy data to be calculated.

- Known QC Check Samples - QC check samples are quality control samples obtained from an outside source with concentrations predetermined by the samples' source. Sources may include U.S. EPA, the National Institute of Standards and Technology (NIST), or a commercial source. The QC check samples may be concentrated requiring dilution into a standard matrix per vendor supplied instructions or fully constituted samples ready to analyze as received. Control limits are provided by the vendor, extrapolated from other in-house control data, or determined from control charts.

  The QC check sample may be used to check the accuracy of an analytical procedure. It is particularly applicable when a minor revision or adjustment has been made to an analytical procedure or instrument. It may also be used for an LCS.

- Matrix QC Indicators - Matrix QC indicators include sample duplicates (DUP) and spikes (MS). Over the last several years, spiked duplicates (MSD) have become popular replacements for laboratory DUPs, and the MSD provides measurement data for precision assessment when target compounds are absent from the sample selected for duplicate analysis.

An MS is an aliquot of an investigative sample which is spiked with the analytes of interest and analyzed with an associated sample batch. The MS discloses the effects of the investigative sample matrix (matrix effects) on the analytical method. A field blank should never be chosen as the sample for matrix spike analysis.

Analysts obtain laboratory duplicate samples by splitting a field sample into two separate aliquots and performing two separate analyses ont he aliquots. The analysis of the duplicates discloses the precision of the analysis; however, it may be affected by nonhomogeneous samples, particularly int he case of nonaqueous samples, as well as reproducibility of laboratory preparation and measurement techniques.

MSs, MSDs and DUPs are performed only in association with selected protocols. Frequency of these matrix QC indicators are specified in Table 2-13. Generally inorganics protocols specify an MS/DUP and organics protocols specify an MS/MSD.

9.3.2 QC Indicators for Instrument Performance

Instrument performance is monitored each day to demonstrate and document that operating conditions are conducive to proper identification of target compounds. The instrument-QC indicators appropriate to each analytical technique are identified in each instrument's method. This section includes a brief, generalized description of the checks. The individual methods for specific instruments provide greater detail.

- Initial Calibration Verification (ICV) - The analyst prepares a calibration standard of known concentration from a source other than the standard used for the initial calibration curve. The ICV is analyzed immediately after the standard curve to confirm calibration.

- Initial Calibration Blank (ICB) - The analyst runs a blank waste or solvent immediately after the standard curve to confirm the calibration and to confirm that a blank is reading less than the reporting limit.

- ICP Interference Check Samples (ICSA/ICSAB) - ICP Interference Check Samples (ICSA/ICSAB) will be analyzed consecutively at the beginning of each eight (8) hour analytical sequence, after the ICV/ICB, and again at the end of each eight (8) hour analytical sequence, prior to the final CCV/CCB. The ICSA/ICSAB is analyzed to verify the absence of spectral interferences.

  Results for the ICP Interference Check Samples shall be within limits of 80 - 120% of the established mean value. If results for the ICSA/ICSAB do not fall within the control limit, the action will be to terminate the analysis, correct the problem, recalibrate, and reanalyze the samples.

  Interferant elements for spectral interferences other than Al, Ca, Fe, and Mg will be made as needed, and documented with the ICP instrument records. The mean concentration will be established by initially analyzing each lot of ICS Solution at least five times for the analytes of concern. The mean determination must be made during an analytical run that meets all ICP QC specifications.

  Alternately, the ICSA/ICSB may be obtained from EPA or a commercial vendor with established mean values provided with the solution.

- Detection Limit Verification Standard - For AA furnace analysis, a standard at the reported detection limit (CRA) will be analyzed after the ICB to verify linearity near the reporting limit for AA analysis. The CRA must indicate a positive recovery for the metal of interest.

  For ICP analysis, a standard at two times the reported detection limit (CRI) will be analyzed after the ICB to verify linearity near the reporting limit for ICP analysis. The CRI will be analyzed again at the end of the eight hour analytical sequence, prior to analysis of the final CCV/CCB. The CRI is not required for Al, Ba, Ca, Fe, Mg, Na, and K, but must indicate a positive recovery for all other ICP metals.

- Continuing Calibration Verification (CCV) - A continuing calibration standard (CCV) is a standard of known concentration made from a source other than the standard used to generate the standard curve. The CCV is analyzed for wet chemistry, and metals analyses to confirm that the calibration has not drifted. The laboratory will perform CCV at a rate of 10 percent (1 per 10 readings) for inorganics wet chemistry analyses. For metals, the CCV is analyzed at 10 percent or for AA furnace every two hours or for ICP every eight hours, whichever is more frequent.

- Continuing Calibration Blank (CCB) - The continuing calibration blank (CCB) is a reagent water blank that the laboratory analyzes at a rate of 10 percent (1 per 10 readings) for analyses of metals and inorganics. The CCB is used to confirm that the baseline has not drifted, and to confirm that the blank is still reading less than the reporting limit.

- Linear Range Analysis Standard (LRS) - For ICP analysis, calibration will be performed quarterly with a blank and a minimum of five (5) standard concentrations to cover the anticipated range of measurement. This will verify linearity and document the upper limit of the linear range for each element. At least one of the calibration standards will be at or near the reporting limit. The calibration curve generated must have a correlation coefficient equal to or greater than 0.995 in order to consider the responses linear over a range. All samples found to be above the ICP linear range will be diluted and reanalyzed.

- Interelement Correction (IEC) - For ICP analysis, correction factors for spectral interference due to Al, Ca, Fe, and Mg will be determined at least annually for all wavelengths used for each analyte reported by ICP, or any time the ICP is adjusted in any way that may affect the IEC's. Correction factors for spectral interferences other than Al, Ca, Fe, and Mg are highly recommended and will be made as needed, and documented with the ICP instrument records.

- GC/MS Tuning and Performance - For GC/MS analysis, mass spectrometers are calibrated with perfluorotributylamine (FC-43) or perfluorophenanthrene (FC 5311) as required to ensure correct mass assignment. In addition, at the beginning of the daily work shift, the GC/MS system must be tuned with decafluorotriphenylphosphine (DFTPP) for semivolatiles analysis, 4-bromofluorobenzene (BFB) for volatiles analysis.

  Performance is further monitored through response to target compounds during initial and continuing calibration, with minimum response criteria for specified system performance check compounds (SPCCs) and linearity verification by evaluating the response factors (RF) for calibration check compounds (CCCs).

Throughout the analysis shift, blanks, internal standard areas, surrogates, shifts in chromatographic baseline, resolution of peaks, and overall quality of the chromatography are used collectively to monitor instrument performance.

9.3.3 Indicators for Method Performance

Analysis Batch

Matrix-specific QC indicators can be used at the instrument to verify how dependable the measurement is for a given sample matrix. These indicators provide information on sample matrix effects which is independent of the efficiency of the preparatory technique. The QC indicators for method performance appropriate to each analytical technique are identified in the various methods. This subsection provides a brief description of these checks.

The QC checks provide a tool for evaluating how well the method worked for the respective matrix. These values are used to assess the validity of a reported result within the context of the project DQOs. For results outside laboratory control limits, appropriate corrective action will be taken and the deviation noted in the case narrative accompanying the sample results.

Serial Dilution

For ICP metals, a five-fold (CLP protocol) dilution of an investigative sample is performed at the instrument to check for possible physical and/or chemical interferences. This sample is referenced as a serial dilution. If the analyte concentration is minimally a factor of fifty above the IDL after dilution, the diluted value should agree within 10% of the original determination to demonstrate no interferences.

Analytical Bench Spike for AA Furnace

Analytical bench spikes are prepared at the instrument by fortifying the digestate with a known quantity of the analyte of interest. A bench spike is performed on each sample immediately following the unspiked analysis. Bench spikes are not required on matrix spikes.

Method of Standard Additions

Method of standard additions (MSA) is performed when specified by analytical protocol or by client request. The correlation coefficient of the MSA curve should be $\geq$ 0.995, and the sample concentration is defined as the y-intercept.

9.3.4 Refrigerator Blanks

Refrigerator storage blanks are placed in VOA sample storage refrigerators at two week intervals, after which time they are analyzed for full VOA Target Compound List analytes by both the GC or GC/MS. These blanks monitor VOA refrigerators for contamination.

9.3.5 Solvent/Reagent Water Approval

Pre-purchase approval of solvents is performed for all solvents purchased in large quantities. This may include, but is not limited to acetone, acetonitrile, ethyl ether, freon, hexane, isooctane, methanol, methylene chloride, or toluene. Prior to purchase, a candidate lot of solvent is put in reserve at the vendor's warehouse. A sample case of the lot of solvent is provided by the vendor to the laboratory for testing. If the solvent passes acceptance criteria, the vendor is notified and holds the lot in reserve for laboratory use. The approved lot of solvent is shipped to the laboratory in increments until the entire lot has been received. Prior to exhaustion of the reserve lot, the process will be repeated with a new lot to ensure a constant supply of approved solvent.

The laboratory tests its on-tap deionized water supply on a daily basis for pH and specific conductivity. In addition, the laboratory tests deionized water with each sample batch for metals.

9.3.6 Balances and Refrigerators

The laboratory monitors daily all analytical balances. The laboratory also monitors daily all refrigerators and freezers used for storage of samples and standards. Refrigerators for storage of samples are monitored twice daily, and include the walk-in coolers. All daily checks are recorded in the respective balance, refrigerator, or freezer log.

9.3.7 Instrument Time Check Verification

The laboratory performs an independent check of GC/MS instrument time clocks twice daily.

SECTION 10

DATA REDUCTION, VALIDATION AND REPORTING

10.1 FIELD MEASUREMENTS

The field logbook will record raw data from field measurements and sample collection activities. No data reduction will take place in the field, and data validation will consist of checking for transcription errors and looking at field logs to ensure that instrument calibrations are done in accordance with appropriate SOPs.

10.2 LABORATORY SERVICES

10.2.1 Data Reduction

Data reduction is performed by the individual analysts and consists of calculating concentrations in samples from the raw data obtained from the measuring instruments. The laboratory will follow procedures specified in OLM01.8 and ILM02.1. The complexity of the data reduction will be dependent on the specific analytical method and the number of discrete operations (e.g., extractions, dilutions, and concentrations) involved in obtaining a sample that can be measured. The analyst will reduce or calculate all raw data into the final reportable values or enter all necessary raw data into LIMS in order for the database system to calculate the final reportable values. Copies of all raw data and the calculations used to generate the final results, such as hard-bound laboratory notebooks, strip-charts, chromatograms, Lotus spreadsheets, and LIMS record files, will be retained on file to allow reconstruction of the data reduction process at a later date.

For data reporting, rounding will not be performed until after the final result is obtained to minimize rounding errors, and results will not normally be expressed in more than two (2) or three (3) significant figures. All results will be reported with the proper measurement units (e.g., mg/L, μg/kg, etc.). The SOPs in Appendix E present the formulas to be used in determining the concentration of contaminants in samples.

10.2.2 Data Review/Data Reporting

Data Review

The individual analyst constantly reviews the quality of data through calibration checks, quality control sample results, and performance evaluation samples. These reviews are performed prior to submission to the Section Manager or the Laboratory Project Manager.

The Section Manager and/or the Laboratory Project Manager review data to ensure consistency with laboratory QC requirements, to verify reasonableness with other generated data, and to determine if program requirements have been satisfied. Selected hard copy output of data (e.g., chromatograms, spectra, etc.) will be reviewed to ensure that results are interpreted correctly. Unusual or unexpected results will be reviewed, and a resolution will be made as to whether the analysis should be repeated. In addition, the Laboratory Project Manager or Section Manager will recalculate selected results to verify the calculation procedure. The SOPs in Appendix D contain control limits for surrogates and MS/MSDs to be used in data review.

Prior to final review/sign-off by the Laboratory Project Manager, the Data Reporting Section will verify that the report deliverable is complete and in proper format, screen the report for compliance to laboratory and client QA/QC requirements, and ensure that the case narrative covers any noted deficiencies The Laboratory Project Manager will be the final laboratory review prior to reporting the results to the Project Manager.

The Laboratory Quality Assurance Section independently conducts a complete review of reports to determine if laboratory and client quality assurance/quality control requirements have been met. The Laboratory QA Section will also review the data packages. Discrepancies will be reported to the appropriate Section Manager and/or Laboratory Project Manager for resolution.

Data Reporting

Reports will contain final results (uncorrected for blanks and recoveries), blank and recovery results, methods of analysis, levels of detection, surrogate recovery data, and method blank data. In addition, special analytical problems, and/or any modifications of referenced methods will be noted. The number of significant figures reported will be consistent with the limits of uncertainty inherent in the analytical method. Consequently, most analytical results will be reported to no more than two (2) or three (3) significant figures. Data are normally reported in units commonly used for the analyses performed. Concentrations in liquids are expressed in terms of weight per unit volume (e.g., milligrams per liter [mg/L]). Concentrations in solid or semi-solid matrices are expressed in terms of weight per unit weight of sample (e.g., micrograms per gram [μg/g]). WESTON-Gulf Coast Laboratories, Inc. uses the standard U.S. EPA data qualifiers in their laboratory reports (e.g., U, J)

Reported detection limits will account for all appropriate concentration, dilution, and/or extraction factors, unless otherwise specified. The laboratory will provide a full CLP data package for this project. The laboratory will provide copies of original data.

The final data report that will be provided by WESTON-Gulf Coast Laboratories, Inc. will be compiled as follows:

Inorganic Data Report

1. Cover letter with Laboratory Manager/Project Manager sign-off
2. Data Qualifiers
3. Chain of Custody
4. Lab chronicle describing: Client ID/Analysis, RFW #, Matrix, Prep #, Collection Date, Extr/Prep Date, Analysis Date, and Section Manager sign-off
5. Case Narrative
6. Client Data Report
7. Quality control summary reports: Method Blank Data Report, Precision Data Report, Accuracy Data Report, and Laboratory Control Standards Report (LCS)

Organic (GC Methods) Data Report

1. Cover letter with Laboratory Manager/Project Manager sign-off
2. Data Qualifiers
3. Chain of Custody
4. Lab chronicle describing: Client ID, Prep #, Collection Date, Extr/Prep Date, Analysis Date, and Section Manager sign-off
5. Case Narrative
6. Client Data Report
7. Quality Control Summary
    A. Surrogate % Recovery
    B. MS/MSD Summary
    C. Method Blank Summary
8. Sample Date Package
    A. Results Summary (Form I)
    B. Chromatograms/Quant Reports - Primary Column
    C. Chromatograms/Quant Reports - Confirmations
9. Standards Data Package
    A. Chromatograms/Quant Reports
10. Raw QC Data Package
    A. Blank Data
        1. Results Summary (Form I)
        2. Chromatograms/Quant Reports - Primary Column
        3. Chromatograms/Quant Reports - Confirmation Column
    B. Matrix Spike Data
        1. Results Summary
        2. Chromatograms - Primary Column
        3. Chromatograms - Confirmation Column

Organic (GC/MS Methods) Data Report

1. Cover letter with Laboratory Manager/Project Manager sign-off
2. Data Qualifiers
3. Chain of Custody
4. Lab chronicle describing: Client ID, Prep #, Collection Date, Extr/Prep Date, Analysis Date, and Section Manager sign-off
5. Case Narrative
6. Client Data Report

7. QC Summary
    A. Surrogate % Recovery Summary (Form II)
    B. Matrix spike (Form III)
    C. Reagent Blank Summary (Form IV)
    D. GC/MS Tuning and Calibration Standard (Form V)
8. Sample Data Package
    A. Sample data in order of analysis
        1. Tabulated Results (Form I)
        2. Tentatively Identified Compound (TIC) (Form 1B) (not applicable to 8310-PAHs)
        3. Raw data in order:
            a. Reconstructed Ion Chromatograms
            b. Quantitation Reports
            c. HSL Mass Spectra
            d. TIC Mass Spectra (not applicable to 8310-PAHs)
            e. GC/MS Library Search for TIC (not applicable to 8310-PAHs)
9. Standards Data Package
    A. Initial Calibration Data:
        1. Form VI
    B. Continuing Calibration Data:
        1. Form VII
        2. Reconstructed Ion Chromatograms and Quantitation Reports
10. Raw QC Data Package
    A. GC/MS Tuning and Calibration Standard
        1. Bar Graph
        2. Mass Listing
    B. Blank Data
        1. Tabulated Results (Form I)
        2. TIC Results (Form IB) (not applicable to 8310-PAHs)
        3. Raw Data
            a. Reconstructed Ion Chromatograms and Quantitation Reports
            b. HSL Spectra
            c. TIC Spectra (not applicable to 8310-PAHs)
            d. GC/MS Library Search for TIC (not applicable to 8310-PAHs)
    C. Matrix Spike Data
        1. Tabulated Results (Form I)
        2. Raw Data
            a. Reconstructed Ion Chromatograms
            b. Quantitation Reports

The final data report will be given to the WESTON Project Managers, the WESTON Project Director, and the Techalloy Project Director. It will be available to the U.S. EPA upon request.

10.2.3 Data Validation

Data validation will be performed by trained WESTON personnel external to WESTON-Gulf Coast Laboratories. Validation will be accomplished by comparing the contents of the data packages and QA/QC results to the requirements contained in the method SOPs. The validation procedures will be based on the following U.S. EPA Region V validation protocol:

- Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses - U.S. EPA, February 1988.
- Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses - U.S. EPA, July 1988.

CLP data validation methods will be used even for non-CLP parameters, such as tin and TSS.

SECTION 11

PERFORMANCE AND SYSTEM AUDITS

WESTON will conduct performance and system audits of both field and laboratory activities. The audits will verify that all personnel perform sampling and analysis in accordance with the QAPP. The two broadest categories of audits are field and laboratory audits. The audits of field and laboratory activities themselves include two independent parts: internal and external audits.

11.1 FIELD AUDITS

Internal audits of field activities will be the primary responsibility of the WESTON Project Director and/or Project Manager. In the absence of both persons, the Field Team Leader will conduct the QA of field activities. In order to judge compliance with established procedures, the audits will include examining field sampling procedures and records, sample collection, handling and packaging protocols, and chain-of-custody procedure. The audits will occur at the start of the project to verify that all established procedures are followed. WESTON will conduct follow-up audits to correct any deficiencies that were previously identified and to verify that QA procedures are maintained throughout the project. Figure 11-1 presents an example of a field audit checklist that WESTON may use for the project.

External field audits are the responsibility of the U.S. EPA Region V's Central Regional Laboratory and/or Central District Office (CDO).

11.2 LABORATORY AUDITS

Performance audits test the laboratory's ability to correctly assay an unknown sample. The audits may be single-blind or double-blind trials. In a single-blind study, the analyst is not

Figure 11-1

Field Audit Checklist

Sample I.D.: ______________________ Date: ___________ Time: ___________

Sample Locations: ____

Samplers: ____

Auditor: ____

Sample Type: (Check One)

{ } Soil Gas { } Air { } Soil { } Groundwater { } Surface Water/Sediment

Sampling Methodology: ____

____

____

Sample Preservation/Handling Procedures: ___________________________

____

____

Nonconformities with Sampling Plan: ______________________________

____

____

Decontamination Procedures: ____________________________________

____

____

Nonconformities with Quality Assurance Project Plan: _________________

____

____

Corrective Actions: ____

____

provided with the acceptable result for the unknown sample until after the experimental results are reported; however, it is known that the sample is a performance test. In a double-blind performance test, the analyst not only has no knowledge of the acceptable result, but the sample is disguised in such a manner as to maintain its anonymity as a performance test sample.

Systems audits and surveillance evaluate the operational details of the QA program. An audit provides a systematic procedure to check the implementation of a specific QA requirement, such as the tracking of samples or chain-of-custody procedures. Audits will be conducted by persons other than those who performed or directly supervised the work being inspected. A surveillance consists of inspection or monitoring of a specific targeted area for compliance to requirements, such as an evaluation of a single analytical method to ensure conformance with the written SOP.

The laboratory audit protocols outlined in this section pertain to WESTON-Gulf Coast Laboratories, Inc. If any additional or alternative laboratories are assigned to perform analyses for the Techalloy RFI via this QAPP, any changes to the audit procedures will be provided to the U.S. EPA for review and approval in a QAPP addendum.

Informal laboratory audits are conducted to verify that stated corrective actions are implemented. Alternative forms of laboratory audits are conducted daily based on a secondary review system that is implemented throughout the laboratory. Secondary reviews include laboratory notebooks, Lotus spreadsheets, organic packages, etc. This type of audit system allows the laboratory to achieve the highest degree of accuracy in documentation and data reporting prior to reporting data to the client.

<u>External Audits</u>

The QA Manager of the WESTON-Gulf Coast Laboratories, Inc. is responsible for scheduling and coordinating all external audits. External performance and system audits of the laboratory are the responsibility of the U.S. EPA Region V Central Regional Laboratory.

Internal Audits

The QA Manager of WESTON-Gulf Coast Laboratories, Inc. has overall responsibility for monitoring the internal Quality Assurance/Quality Control program. The QA Section Manager has a staff to provide in-house audits, and to review and evaluate analytical data packages.

Internal performance audits conducted at the bench level provide the analyst with a tool to evaluate the acceptability of a specific data set. This is accomplished through analysis of laboratory control samples or spike blanks of known concentration to the analyst which must meet minimum performance standards. When the analyst performs the QC checks in duplicate, the method's accuracy and precision can be determined. This information can demonstrate the proper functioning of the total measurement system.

As an additional feature of the laboratory's internal QA Program, double-blind performance evaluation samples are periodically submitted for analysis. These samples originate both internally and externally, and are scheduled through the laboratory's project management system to ensure sample anonymity. Every three months, samples are submitted to cover all routinely analyzed methods.

WESTON-Gulf Coast Laboratories, Inc. analyzes externally originated double-blind samples quarterly for full organic and inorganic target compound list parameters in both soil and water. The laboratory purchases externally originated samples from a commercial vendor (currently Environmental Resources Associates) in a concentrated form. WESTON initiates these external double-blind samples using the same procedures used for routine clients through a designated WESTON Project Manager. For example, the double-blind test includes providing a work order number, a schedule for analysis (using a "fake" client name, which changes quarterly), and bottle orders so that samples arrive in standard containers.

This system effectively delivers samples the laboratory for unbiased analysis. The WESTON Project Manager compiles the results and submits them to the QA Section for review and evaluation. Any noted deficiencies are addressed with the appropriate laboratory service group and a corrective action plan is implemented, as needed.

Internally originated samples are handled in the same manner as the externally purchased double blinds, except that they are prepared by the laboratory and are unknown to the analysts, using U.S. EPA, National Institute of Standards and Technologies, or commercially available reference materials.

Internal laboratory systems audits and surveillance will be conducted and documented on a quarterly basis, at a minimum. Each quarter's audit will target a limited section of the laboratory and will be coordinated such that the entire laboratory is planned for QA audit at least once annually. Unique client audit procedures and data requirements will be complied with as contractually specified. The internal audit consists of a review of laboratory systems, procedures and documentation. Any deficiencies and/or deviations are documented and a summary report is prepared.

Items that may be included for focus in routine laboratory system audits and surveillance include, but are not limited to, the following:

- Life of reagents.
- Holding times.
- Interferences (if any).
- Maintenance logs.
- Standards traceability.
- Preparation of glassware.
- Sample preservation.
- Equipment/instrumentation.
- Computer spreadsheets.
- Calculations.
- Standard deliverables.
- Lab book documentation.
- Safety.
- Method detection limits.
- Current standard operating. practice.

The system audit report is distributed to the responsible party, including the appropriate supervisor. A maximum of two weeks is given to address any recommended corrective actions. The QA Section retains the original copy of the completed responses on file.

Figure 11-2 presents an example of a laboratory monthly audit checklist that may be utilized for this project.

Figure 11-2

Example of a Monthly Laboratory Audit Checklist WESTON/Gulf Coast Inc.

☐ **Temperature Control Logs**

- Daily monitoring of sample storage refrigerators/freezers.
- Daily monitoring of standard/reagent refrigerators/freezers.
- Daily monitoring of incubators/water baths used in micro.
- Monitoring of wet chemistry solids ovens (when in use).
- Thermometers are calibrated against an NIST thermometer on a yearly basis; quarterly for the micro area.

☐ **Balance Control Logs**

- Balance calibration checks are performed daily using Class "S" weights.
- Balance maintenance agreements are in existence for bi-yearly calibration.

☐ **Eppendorf Control**

- Calibrated monthly.

☐ **Laboratory Equipment Monitoring Databooks**

- A maintenance log is present for all major pieces of equipment.
- Documentation of instrument maintenance performed by the analyst or service representative is complete.
- Laboratory hoods are monitored on a quarterly basis.

☐ **Water Quality**

- Laboratory water quality is measured and documented daily.
- All necessary corrective action measures were clearly documented and taken in a timely manner.

☐ **Refrigerator Trip Blank and Daily Trip Blank Spreadsheets**

- The refrigerated blank (RTB) spreadsheet for GC and GC/MS VOA analysis was maintained up-to-date.
- All RTB contaminant levels were documented, and all necessary corrective action measures were taken.
- The daily trip blank spreadsheet was up-to-date.
- The Bottle Project was notified if any contamination was present in the trip blank water.

Figure 11-2

Example of a
Monthly Laboratory Audit Checklist
WESTON/Gulf Coast Inc.
(Continued)

☐ **Solvent Purity Summary**

- The solvent lot testing summary is up-to-date.
- Any contaminant found as a result of the pre-testing resulted in the rejection of the solvent lot.

☐ **MS Time Check Log Book**

- The times on the GC/MS instruments and associated data files are verified daily against the run log books.
- Proper corrective action measures were taken for all time discrepancies.

☐ **Laboratory Data Notebooks Reviewed for Completeness Upon Retiring**

- All analyst signature are present in the forward of the databook.
- All data pages have been Z'd out, signed, and dated by the analyst.
- All data pages are signed by a peer reviewer.

☐ **Analyst Training Files**

- Issued for each analyst.
- Updated on a yearly basis, if not sooner.

☐ **Policy Directive - Standard Operating Procedures (SOPs)**

- SOPs are reviewed and updated on a yearly basis, if not sooner.

☐ **Performance Evaluation Sample Summary Table**

- All written responses to any Performance Evaluation Sample (PES), results which did not meet the acceptance criteria, were completed within the require time.
- All corrective actions stated in the deficiency responses have been implemented.
- All PES data results are entered into a database.

☐ **Methods Validation Studies**

- Instrument Detection Limits (IDLs) Studies for the metals analysis are performed/compiled on a quarterly basis.
- Method Detection Limits (MDLs) Studies are performed and compiled yearly for routine methods in the laboratory.

SECTION 12

PREVENTATIVE MAINTENANCE PROCEDURES

12.1 FIELD EQUIPMENT

For the present project, the field equipment includes a field pH meter and a specific-conductance and temperature meter. Appendix B discusses the specific preventive maintenance procedures for this equipment. The field team will care for the equipment as discussed in the appendix and as recommended by the manufacturer's specifications. The FTL will be responsible for using and documenting these procedures in the field logbook or on the proper forms on a weekly basis during the period of use.

Normally, WESTON's Equipment Manager will perform preventive maintenance on the field instruments prior to the equipment leaving the WESTON equipment store. However, if necessary, the FTL can perform additional maintenance at the facility on an as-needed or an as-recommended basis.

12.2 LABORATORY EQUIPMENT

The preventative maintenance protocols discussed in this section pertain to WESTON-Gulf Coast Laboratories, Inc. If any additional or alternate laboratories are assigned to perform analyses via this QAPP, any changes to the maintenance procedures will be provided via an addendum to the QAPP, and will be submitted to the U.S. EPA.

The ability to generate valid analytical data requires that all analytical instrumentation be properly and regularly maintained. The responsibility of routine care lies with the analysts using the instruments. Guidance on required routine maintenance, as well as troubleshooting information, is provided in the respective instrument manuals and laboratory operating procedures. For more extensive preventative maintenance or emergency repair service, the analytical laboratory maintains full service contracts on all major instruments. The elements of the maintenance program are discussed below.

12.2.1 Instrument Maintenance Logbooks

Each analytical instrument is assigned an instrument logbook. All maintenance activities are recorded in the instrument logbook. The information entered in the instrument logbook includes:

- Date of service or maintenance.
- Person performing service or maintenance.
- Type of service performed and reason for service.
- Replacement parts installed (if appropriate).
- Documentation of the re-establishment of working order.
- Miscellaneous information.

If service is performed by the manufacturer, a copy of the service record (when available) is affixed to the notebook page, or cross-referenced in the notebook to a separate maintenance file. The service record should include sufficient detail to describe the service performed (e.g., not "service call," but "replaced pump motor gear"). If the service record does not spell out this information, it must be written separately into the maintenance log.

12.2.2 Instrument Maintenance and Repair

Preventative maintenance and repairs that cannot be performed by laboratory staff are contracted to the manufacturer's service department or to an authorized maintenance vendor. WESTON's service agreements provide for preventative maintenance, emergency service, and emergency shipping of spare parts. Annual service of the laboratory balances is an example of contracted preventative maintenance. For emergency response, service contracts on the Gas Chromatographs, GC/MS instruments and AA-ICP require on-site response within 48-72 hours. (Typically, service representatives are at the laboratory within 24 hours of a service call.) The service contracts also provide for 24-hour delivery of critical spare parts in response to a service request.

The maintenance procedures and frequencies for major analytical instrumentation are summarized in Table 12-1.

12.2.3 Spare Parts

WESTON-Gulf Coast Laboratories, Inc. maintains an inventory of routinely required spare parts (e.g., spare sources, vacuum pumps and filaments for GC/MS, spare torches, burner heads for AA-ICP).

The instrument operators have the responsibility, with the appropriate Section Manager, to ensure that an acceptable inventory of spare parts is maintained.

12.2.4 Contingency Plans

Properly maintained equipment will provide dependable service; however, emergencies cannot be totally avoided. Major equipment, such as the LIMS and GC/MS instrumentation, are backed up with an uninterrupted power supply (UPS) to provide continuous operation through electrical power outages and "brown outs." If a power failure occurs during non-working hours (defined here as other than the normal 8:00 a.m. to 5:00 p.m. work week), the same security system which controls building access will activate an alarm to the security agency. Supervisory and building maintenance personnel are notified

Table 12-1

Equipment and Maintenance
Techalloy Company, Inc.
Union, Illinois

Instrument	Procedure	Frequency
AA	Clean optics and windows	Daily
(Graphite Furnace)	Replace windows	As required
	Check or change cuvette	Daily
	Check & drain compressor drain	Daily
	Clean atomizer cell	Daily
	Nebulizer cleaned/dried	Weekly or as required
	Check/change marble stones	Weekly
	Clean filters	Weekly
AA (Cold Vapor Hg)	Clean scrubber tube/replace H_2SO_4 or $MgClO_4$	Daily
	Clean aerator	Daily
	Check tubing for moisture	Daily
	Change activated carbon/glass wool	Weekly
	Check/clean sample cell	Weekly
	Change tubing	Monthly or as required
ICP	Check pump tubing	Daily
	Check liquid argon supply	Daily
	Check fluid level in waste container	Daily
	Check filters	Weekly
	Clean or replace filters	As required
	Check/clean torch and carbon ignition tip	Weekly
	Check sample spray chamber for debris	Monthly
	Clean and align nebulizer	Monthly
	Check entrance slit for debris	Monthly
	Change printer ribbon	As required
Hewlett Packard	Ion gauge tube degassing	As required
GC/MS	Pump oil-level check	Monthly
	Pump oil changing	Semi-annually
	Analyzer bake-out	As required
	Analyzer cleaning	As required
	Resolution adjustment	As required
	COMPUTER SYSTEM AND PRINTER:	
	Air filter cleaning	As required
	Change data system air filter	As required
	Printer head carriage lubrication	As required
	Paper sprocket cleaning	As required
	Drive belt lubrication	As required
Balances	Class "S" traceable weight check	Daily, when used
	Clean pan and check if level	Daily
	Field service	Annually
Drying Ovens	Temperature monitoring	Daily
	Temperature adjustments	As required

via beeper call, and can be on site within 20 minutes or remain on stand-by alert until the emergency is passed or further action is necessary. Some laboratory personnel from night shift will often already be on site. Service is generally restored within an hour, and the UPS coverage is sufficient to carry operations through until electric service is restored (up to a minimum of one hour). For prolonged power outages, laboratory personnel on stand-by alert will prepare for an organized, systematic shutdown of major equipment. A decision on the need for auxiliary backup generators to run storage refrigerators will be made.

With respect to instrument-related downtime, an attempt is made to maintain extra equipment to cover short-term losses due to repairs. For long-term downtime, arrangements can be made to rent appropriate equipment until necessary repairs can be completed.

SECTION 13

SPECIFIC ROUTINE PROCEDURES TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

13.1 FIELD MEASUREMENTS

Field data will be assessed by the field team leader or his designee. The field team leader or his designee will review the field results for compliance with the established QC criteria that are specified in the QAPP. Accuracy of the field measurements will be assessed using daily instrument calibration and QC checks with standard solutions.

Precision will be assessed on the basis of analysis of duplicates. Data completeness will be calculated using Equation 13-1.

$$\text{Completeness} = \frac{\text{Valid Data obtained}}{\text{Total Data Planned}} \times 100 \qquad \text{Equation 13-1}$$

13.2 LABORATORY DATA

Laboratory results will be assessed for compliance with required precision, accuracy, completeness and sensitivity as discussed in the following sections.

13.2.1 Precision

Precision of laboratory analysis will be assessed by comparing the analytical results between MS/MSD for organic analysis and laboratory duplicates for inorganic analysis. The relative percent difference (RPD) will be calculated for each pair of duplicate analysis using Equation 13-2.

$$\%RPD = \frac{S - D}{(S + D)/2} \times 100 \qquad \text{Equation 13-2}$$

Where: S = First sample value (original or MS value)
D = Second sample value (duplicate or MSD value)

13.2.2 Accuracy

Accuracy of laboratory results will be assessed for compliance with the established QC criteria that are described in Section 4 of the QAPP, using the analytical results of method blanks, reagent/preparation blank, and matrix spike/matrix spike duplicate samples. The percent recovery (%R) of matrix spike samples will be calculated using Equation 13-3.

$$\%R = \frac{A - B}{C} \times 100 \qquad \text{Equation 13-3}$$

Where:

A = The analyte concentration determined experimentally from the spike sample;

B = The background level determined by a separate analysis of the unspiked sample and;

C = The amount of the spike added.

13.2.3 Completeness

The data completeness of laboratory analyses results will be assessed for compliance with the amount of data required for decisionmaking. Data completeness will be calculated using Equation 13-4.

$$\text{Completeness} = \frac{\text{Valid Data Obtained}}{\text{Total Data Planned}} \times 100 \qquad \text{Equation 13-4}$$

13.2.4 Sensitivity

The achievement of method detection limits depend on instrumental sensitivity and matrix effects. Therefore, it is important to monitor the instrumental sensitivity to ensure the data quality through constant instrument performance. The instrumental sensitivity will be monitored through the analysis of method blank, calibration check samples, laboratory controlled sampling, the low concentration calibration standards, etc., in accordance with the requirements of the analytical SOPs (Appendix D).

SECTION 14
CORRECTIVE ACTION

Corrective actions may be required for two classes of problems: analytical and equipment problems, and noncompliance problems. Analytical and equipment problems may occur during sampling, sample handling, sample preparation, laboratory instrumental analysis, and data review.

For noncompliance problems, a formal corrective action program will be determined and implemented at the time the problem is identified. The person who identifies the problem is responsible for notifying the WESTON Project Manager if the problem occurs in the field, or the Laboratory Section Manager or QA Manager if the problem occurs in the laboratory. It will be the Laboratory Manager's responsibility to notify the WESTON Project Manager or Project Director and inform him of the problem. Problems will be communicated to the U.S. EPA's RCRA Project Coordinator. WESTON will confirm implementation of corrective action in writing through the same channels.

Any nonconformance with the established quality control procedures in the QAPP will be identified and corrected in accordance with the QAPP. The U.S. EPA's RCRA Project Coordinator will issue a Nonconformance Report for each nonconformance condition.

14.1 CORRECTIVE ACTIONS IN THE FIELD

During all field activities, technical staff and project field personnel will be responsible for reporting all suspected technical or QA nonconformance or suspected deficiencies of any activity or issued document by reporting the situation to the Field Team Leader. The Field Team Leader will be responsible for assessing the suspected problem and notifying